

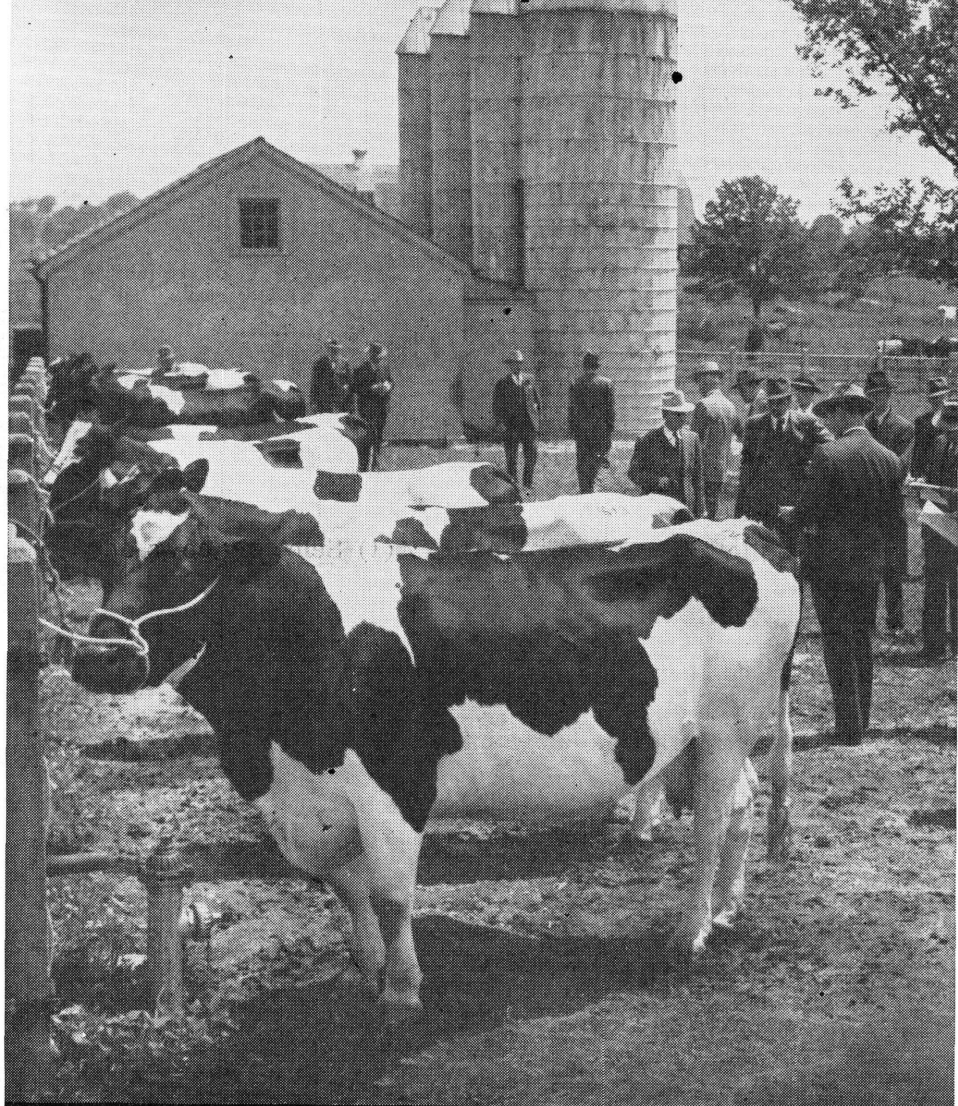
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SELECTING DAIRY CATTLE

On the basis of type and production records



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TO BE A SUCCESSFUL DAIRY FARMER it is necessary to be able to make wise selections of individual animals when establishing a herd and when providing replacements of cows and herd sires. This requires a knowledge of sound methods of evaluating type, records of production, and the ability of animals to transmit desirable type and high producing capacity to their offspring.

To a great extent the show ring sets the pattern for many of the practices followed by dairy cattle breeders, and for much of the educational work in dairy cattle subjects that is carried on with "future farmer" groups, 4-H clubs, college students, and dairy farmers and breeders.

In the show ring, little attention has been paid to the demonstrated producing capacity of the animals entered for competition. To make show-ring competition truly educational, both type and producing capacity should be stressed in judging the animals because profitable production is the ultimate objective of all dairy cattle work.

This bulletin describes plans for: (1) Selecting cows on a definite numerical basis in which both type and production records are taken into account; (2) selecting herd sires on the basis of the type and production records of their daughters; and (3) conducting demonstrations and judging contests in which evaluation ratings for type and for production are combined in determining the final placing of the animals.

This bulletin supersedes Miscellaneous Publication No. 409, Judging Dairy Cattle on the Basis of Type and Records of Production.

SELECTING DAIRY CATTLE ON THE BASIS OF TYPE AND PRODUCTION RECORDS

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INTRODUCTION

ABILITY TO RECOGNIZE the most desirable characteristics of dairy cattle and to make wise selections, when establishing a herd or making replacements, is essential for successful dairy farming. It requires a knowledge of dairy cattle type and also a knowledge of sound methods of interpreting records of milk and butterfat production. It also requires a knowledge of how to evaluate the type and producing capacity of the individual animal and the ability of the animal to transmit desirable type and producing capacity to its offspring.

Some dairymen are inclined to make selections entirely on the basis of type; others consider production records to be all-important and pay little attention to type. The wise dairyman pays attention to both. It is not the purpose of this publication to specify the relative importance of dairy type and production records, but rather to stress the importance of taking both factors into account and to describe a method of combining them on a definite numerical basis for use in

selecting the most desirable individual animals. The method is equally workable whether one is selecting animals in a herd or judging them in a show ring.

The dairy cattle show ring is important because of the opportunity it affords for inspiring the dairyman to improve his stock, by holding up to him an ideal toward which to work. The ideas and ideals established in the show ring, by exhibitions and judging contests, have a marked influence on the opinions and practices of dairy cattle breeders and permeate the field of education in dairy cattle subjects. The following discussions, therefore, will make repeated references to judging and to the show ring. Because of the inspirational and educational influence of the show ring and because more profitable production is the ultimate objective of all work with dairy cattle, it is both desirable and important that the judging and showing activities be conducted on a basis that will emphasize production performance as well as excellence of breed type.

A PLAN FOR JUDGING ON THE BASIS OF TYPE AND RECORDS OF PRODUCTION

The judging of dairy cattle at shows and fairs in this country is based largely on the physical appearance and condition of the animals as they appear in the show ring; that is, they are placed according to their beauty and general symmetry, or adherence to breed type, on the assumption that type is closely associated with utility values. Actually, however, a cow has little chance of winning in the show ring if she has a defect in body outline, no matter how excellent her producing capacity may be.

Bulls are judged on the basis of their conformation and masculinity, although it is now generally recognized that a bull's appearance is no indication of the production inheritance he transmits to his offspring. Emphasis on type, particularly on the finer show-ring points, too often serves to minimize the educational value of cattle shows and judging contests by overshadowing the real purpose for which cattle are bred.

For many years it was necessary, of course, to judge the utility value of dairy animals by their physical appearance alone. Now, however, since production records afford a definite means of measuring the producing capacity of cows and the breeding values of sires, it appears that the judging standards, at least those for judging cows and bulls, might well include a consideration of available production records.

In this publication, a plan is outlined for judging cows on the basis of combined ratings for type and production performance; for judging sires on the basis of the type-and-production rating of their respective daughter groups; for judging cows by groups; and for conducting dairy-cattle judging contests in which the combined-rating system is used. Obviously, the system cannot be applied to the judging of heifers and young bulls, or to older bulls that have no daughters with production records.

Under the plan described here a class of cows in the show ring is first judged on the basis of type, and alined as usual. Each cow is assigned a numerical rating for type which represents her relative position in line, and also a numerical rating representing the relative position of her production record in the class. The two ratings are then com-

bined and the cows are realigned on the basis of the combined rating for type and production.

Somewhat the same system is used in judging sires, by the type-and-production ratings of their daughters. Each sire's daughters are treated as a group, first being judged for type and then given numerical ratings for type, average butterfat production, increase or decrease in butterfat production as compared with their dams, and the percentage of daughters better than their respective dams.

Extension workers, club leaders, and others who are interested in introducing this plan of judging in local shows, in judging contests, or in class-room work will find it helpful at first to use photographs of cows instead of the living animals. The use of photographs in demonstrating the plan of judging on the basis of type and records of production is discussed on page 28.

EDUCATIONAL ADVANTAGES OF THE PLAN

The type-and-production plan of judging dairy cattle is designed to induce breeders of high-producing dairy cows of good conformation to enter them in show-ring competition, thereby obtaining recognition of their breeding accomplishments and making the educational features of the show ring more valuable to breeders, to students, and to the public. The plan for evaluating the breeding performance of herd sires, by judging the type of their daughters and considering the relation of the daughters' production records to those of the dams, is presented as a sound basis for selecting a sire.

The general adoption of this system of judging in local, State, and regional shows would provide a field of competition for the large group of constructive breeders who, under existing conditions, have little incentive to exhibit their cattle. It would give a new value to the show ring. By placing emphasis on a cow's ability to produce, and upon a sire's ability to transmit the essential production factors to his offspring, the judging would direct attention to utility as well as to beauty of form.

The adoption of a plan of progressive showing, whereby the winners at local shows would compete in State shows and the winners at State shows would compete in regional or national shows, would create local interest among breeders, which would be carried forward with increasing intensity to the final showing of the season. Such a plan would broaden the field of competition still further by extending it to a larger number of "small" breeders; and it would tend to overcome the existing tendency toward professionalism in show-ring competition. Furthermore, it would add to rather than detract from the "sporting feature" of the show ring because of the increased number of breeders exhibiting.

The dairy-cattle judging contest is looked upon as having great educational importance. The plan of judging on which such contests are based furnishes the pattern for practically all the instruction in dairy-cattle judging, reaching hundreds of students in agricultural colleges and approximately 150,000 boys and girls in 4-H clubs and vocational agricultural schools throughout the United States each year. It is highly important that the contest be based on a sound system of judging dairy cattle. Adoption of this type-and-production

judging plan in students' contests would direct attention to performance as well as to type in dairy cattle. Students would be required to exercise greater judgment because of the larger number of animals, and classroom practice and contest judging would more nearly resemble the procedure of the judge in the show ring. If judging contests were conducted according to the suggested plan, all students taking dairy cattle judging work would be given a more practical and useful kind of training—a basis for determining the comparative commercial value of the animals in any group or herd—which would better fit them to make wise selections of cows and herd sires and to solve the practical problems of selection and breeding, for which they may subsequently become responsible.

The plan for judging cows on the basis of combined ratings for type and production, which was outlined first in 1917,¹ and again in 1930,² has been used in connection with dairy-herd-improvement-association shows and exhibits in several States. It has also been used successfully at local and county fairs; at production shows for dairy cattle; and at meetings of farmers, club members, college students, college professors, and other educators in widely distributed sections of the United States.

The judging-contest features of the plan have been carried out with cow classes at many gatherings, where in some cases as many as 50 contestants took part. These contests have been highly successful, except for the matter of numerous ties in contestant grades. Use of the grading system proposed in this publication will practically eliminate the possibility of ties in contestant grades unless 2 or more contestants turn in identical placings or unless the interchange of animals is confined to the last few places in large classes.

PLAN FOR JUDGING COWS AS INDIVIDUALS

This plan of judging dairy cattle on the basis of type and demonstrated producing capacity should not be confused with the plan used in the so-called production shows that have been held in different sections of the United States in recent years. In these shows it has been the practice to require that all cows entered have a certain minimum production record to make them eligible to be judged on the basis of type. While such a system does limit competition to cows that have met a moderate production requirement, it gives no consideration to differences in producing capacity. In such a system a cow gets no credit for superior producing ability, the cow that barely meets the minimum requirements for entry having the same chance of being placed first as one having a record of 1,000 pounds or more of butterfat for a year.

ANIMALS ADMITTED AND CLASSES TO BE JUDGED

In using this plan for show-ring judging it would be necessary to admit only cows that have records of production. It would be desirable, if possible, to have separate classes for cows whose records were made under widely different environmental conditions. Otherwise

¹ GRAVES, R. R. PRODUCTION IN THE SHOW RING. *Hoard's Dairyman*, 57: 44. 1919.

² SWETT, W. W., and GRAVES, R. R. A PLAN FOR A STUDENTS' DAIRY-CATTLE JUDGING CONTEST. U. S. Bur. Dairy Indus. BDIM-537. 18 pp. [1930.] [Mimeographed.]

adjustment factors might have to be used to put the records on a comparable basis. If desired, separate classes could be provided for cows with official records and for cows with records made in dairy-herd-improvement associations. At least three age classes would be desirable for all show-ring competition: One for cows 3 years of age and under 4, one for cows 4 years of age and under 5, and one for cows 5 years of age and over. Production records made prior to these ages could be used if corrected to the age of the class in which the cow is entered.

The breed associations might be given the responsibility of correcting and certifying the official records made by each cow exhibited, at least in the larger shows. The necessary corrections and the certification of all dairy-herd-improvement-association records might be made by the State dairy extension specialist in the case of local or State exhibition and by committees of such State specialists where regional or national competition is involved. If a cow entered for competition in any class should have more than one certified record of production completed prior to the closing date for entry to the fair or show, the exhibitor would be permitted to use the highest one.

NUMERICAL BASIS FOR COMBINING TYPE AND PRODUCTION RATINGS

To be effective, any plan for placing animals on the basis of combined type and production ratings must have a definite numerical basis for determining the ranking of every cow in the class. Opinions may differ as to the relative importance of type and production. Any given ratio that may be agreed upon will be applicable to the plan given herein. It may be a 50-50, a 40-60, or a 25-75 ratio. The plan for cows, as illustrated in this publication, is based on a 50-50 ratio; that is, it gives equal weight to the cow's type and to her demonstrated capacity for production, in determining the final placing.

CARD FOR USE IN PLACING COWS

The placing card shown on page 6 was developed to facilitate the final placing of a class of cows (fig. 1). The card is designed to accommodate a class of any number up to 10 cows but can be enlarged to take care of a class of any size. The numbers at the extreme left indicate the order of procedure to be followed by the judge.

In this card and in the card for placing sires (fig. 3) the ratings allowed for butterfat production are 10 percent of the butterfat record. If desired, one point may be allowed for each pound of butterfat and the decimals in all ratings omitted. Otherwise the procedures would be as described.

Also, in these cards and in the discussions pertaining to judging contests, the animals may be designated, if desired, by numbers instead of letters without altering the procedures.

The use of the card is illustrated in the following discussion of the judging plan. In this discussion, it is assumed that a class of 10 cows, lettered from A to J, is to be judged and that the age-corrected butterfat production of each cow in pounds is as follows: A, 640; B, 988; C, 402; D, 591; E, 644; F, 601; G, 701; H, 810; I, 488; and J, 872.

PLACING CARD FOR COWS

[When judged on basis of combined type and production ratings]

Breed _____ Age class _____ Date _____ Judge _____

Order of procedure ¹	Cows in the class, and the placings and ratings for each									
	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th
1. Placing on type	E	G	H	B	C	J	I	A	F	D
3. Rating on type ² (uniform intervals)-----	98.8	92.3	85.8	79.3	72.8	66.3	59.8	53.3	46.8	40.2
4. Rating on type (adjusted intervals)-----	98.8	97.0	83.6	80.0	77.2	66.3	60.8	55.3	49.8	40.2
2. Rating on production (10 percent of b'fat record)--	64.4	70.1	81.0	98.8	40.2	87.2	48.8	64.0	60.1	59.1
5. Combined rating (No. 4 plus No. 2)---	163.2	167.1	164.6	178.8	117.4	153.5	109.6	119.3	109.9	99.3
6. Final placing of the class (based on combined rating)--	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th
	B	G	H	E	J	A	C	F	I	D

¹ Order of procedure indicated by the number at the left of each item.² The cow that was placed first on type is given a numerical rating for type which is the same as the rating for the highest production in the class, and the cow that was placed last on type is given the same numerical rating as was given for the lowest production in the class. (See item 2.)

The average interval used in allocating the intermediate type ratings is determined by dividing the difference between the maximum and minimum ratings by a number that is one less than the number of cows in the class, as follows:

Maximum 98.8; minimum 40.2; difference 58.6 divided by 9 equals 6.5, the average interval.

FIGURE 1.—Placing card for use in judging cows on the basis of combined type and production ratings. The card has been filled in to illustrate the results of judging a class of 10 cows.

PLACING ON TYPE

The cows in any class are first judged on the basis of type in the usual way, and the letter or number identifying each cow is entered on the placing card in the proper space on the line marked, "1. Placing on type." Suppose, for example, the order of placing on type in this class is E-G-H-B-C-J-I-A-F-D. (See fig. 1.)

RATING ON PRODUCTION

After the cows in the class have been judged on type and their placings have been entered on the card, each cow is assigned a production rating equal to 10 percent of her age-corrected butterfat

production record. For example, a cow having a record of 988 pounds of butterfat would be given a production rating of 98.8 points. Both the age-corrected production records and the ratings obtained from them should be determined before the judging of the class is commenced and should be presented to the judge by a clerk as soon as the alinement on type is completed. The judge or the clerk then enters the rating for each cow in the proper space on the line marked, "2. Rating on production." Cow E in the above illustration, with an age-corrected butterfat production record of 644 pounds, was assigned a rating of 64.4; cow G, with a record of 701 pounds, was assigned a rating of 70.1, and so on. (See fig. 1.)

RATING ON TYPE

Uniform Intervals

The total range of the ratings on type for any class of cows must be the same as the total range of ratings on production, otherwise undue emphasis will be placed either on type or on production in arriving at the final placing of the class. To make this possible the cow placed first on type is given a rating on type equal to the highest production-rating in the class, and the cow placed last on type receives a rating on type which is equal to the lowest production-rating in the class. Cows placed between the highest and the lowest on type are, of course, given intermediate ratings.

In determining the intermediate ratings, the average interval between ratings on type is obtained by subtracting the lowest from the highest rating and dividing the difference by a number which is one less than the number of cows in the class. In this case the highest rating is 98.8, the lowest is 40.2, the difference is 58.6, and the average interval is 6.5. If the average so determined is subtracted from the rating for the cow placed first, the rating for the cow placed second is obtained. The same average subtracted from the rating for the cow placed second gives the rating for the cow placed third, and so on to the rating for the cow placed last, which was established by and is identical with the rating for the lowest production record.

The intervals between the ratings on type obtained in this manner are equal, except for the possibility that a slight variation between the last two cows may result from dropping decimals in determining the average interval. If preferred the order of procedure may be reversed, the average interval being added to the rating given the cow placed last to obtain the rating for the cow placed next to last, and so on. The ratings on type are entered on the line marked, "3. Rating on type (uniform intervals)." (See fig. 1.) The range may be greater or it may be less than the one illustrated (58.6 points) but that will not affect the accuracy of the method.

The magnitude of the ratings on type is determined by the level of production of the cows in the class. Type ratings should not be confused with scores for type that supposedly represent percentages of perfection.

Adjusted Intervals

The ratings separated by uniform differences would be satisfactory if the difference in type between each pair of cows were of the same

importance. It is obvious, however, that in almost any class of cows, some individuals are so nearly equal in excellence of type as to make placing difficult, whereas others differ so greatly in type that placing them offers little difficulty. Under such circumstances a direct application of the average interval, with evenly spaced ratings, does not permit an equitable evaluation of the relative type of the individual cows.

To take care of such cases the judge is given an opportunity to adjust the ratings in such a manner as to show the importance of the differences in type between individual cows. In the case of very close pairs or groups of cows the interval may be reduced to almost nothing and in the case of cows differing greatly in type the interval may be increased accordingly.

On the placing card the line marked, "4. Rating on type (adjusted intervals)," is provided to allow the judge to assign ratings on adjusted instead of equal or uniform intervals. In making these adjustments the ratings for the cows placed first and last on type must remain unchanged but the intermediate ratings may be left entirely to the discretion of the judge. In the class illustrated E and G are a close pair but far superior to H; H, B, and C are comparatively close, with C distinctly superior to J; and J, I, A, and F are somewhat similar in type and distinctly superior to D. It will be noted in the illustrated placing card (fig. 1) that the first two adjusted ratings are nearly the same. There is a difference of 13.4 points between the second and third cows; the intervals between the next three are only about half the average interval; the interval between C and J is 10.9 points; the intervals between the next three cows are only slightly below the average; and the interval between the last two is high.

COMBINED RATING

As already stated, this plan is designed to give equal consideration to type and to producing capacity in judging cows. By adding the adjusted rating on type to the corresponding rating on production for each cow, ratings are obtained for the final alinement of the class. The totals are entered in the spaces provided on the line marked "5. Combined rating."

FINAL PLACING

The letter or number identifying the animal having the highest combined rating is placed in the first square on the line marked "6. Final placing of the class." The one having the second highest combined rating is placed in the second square and so on until the final placing of each cow in the class is recorded on the card. (See fig. 1.) The class of cows is then realigned in the ring in accordance with this combined rating.

In the class illustrated it is noted that, although the first four animals on type remain in the first four places in the final alinement, the first and fourth are interchanged; D remains in last place because her type rating was the lowest and her production was comparatively low; but there was a change in final placing of all the others except G and H, the cows that were placed second and third on type.

PLAN FOR JUDGING COWS BY GROUPS

Within recent years the Danish system of judging, or some modification of it, has been used in the United States, apparently with increasing popularity. In such a system, the judge, after alining all the cows in a class from the best to the poorest, places them in groups, each group representing a different degree of excellence in type. The cows meeting the established standards for any particular group are placed in that group and each receives the ribbon or award bestowed upon animals placed in that particular group.

There is much to be said in favor of this system of judging. It gives recognition to all exhibitors that have attained certain standards of excellence rather than to the few who are fortunate enough to exhibit the top-ranking animals. The system also makes it easily possible for the judge to avoid making first prize awards to mediocre animals.

For example, in some local shows the type of the animals might be definitely inferior to that of the animals exhibited at the larger shows. Under the Danish system the judge can give a second or third rating to the best animal in the class, whereas on the basis of judging generally employed in cattle shows the best animal exhibited usually is given a blue ribbon or other first-class designation even though its type may be far from excellent. This plan also has the advantage of classifying the animals exhibited into groups representing recognized standards of excellence rather than unduly stressing the importance of the two or three top places among which the actual difference in excellence of type may be of little if any importance. The plan apparently is gaining in favor, particularly in shows where the first consideration is to make the show as highly educational as possible. If the group system of judging is meritorious in the smaller shows because of its superior educational value there is every reason to believe it would be equally or even more meritorious in the larger shows.

In most of the shows where the group plan has been employed consideration apparently has not been given to the production records of the animals exhibited, at least not beyond the possible requirement of a minimum production record for eligibility. It is entirely feasible and practicable to apply the system of combined ratings for type and production when the animals are placed on type by groups according to the Danish system. The procedure is described in the following pages.

ESTABLISHING A BASIS FOR COMBINED TYPE AND PRODUCTION RATINGS

It is first necessary to establish some basis for grouping the individual cows according to level of production. Obviously such a grouping must be arbitrary. The same number of groups should be provided for production as for type. There should be at least four such groups. More than four might be provided if desired. Owing to differences in conditions of environment and management under which records of cows exhibited at shows are made, it will be necessary either to vary the limits of such production groups to meet the prevailing levels of production at the different shows, or else to convert all production records to some definite basis such as the 305-day record made on two milkings daily, or the 365-day record made on three milkings daily.

The following ranges for production groups are suggested for cows that have made records under official test conditions: Group 1, 850 pounds butterfat or more; group 2, 700 to 849 pounds; group 3, 550 to 699 pounds; and group 4, 400 to 549 pounds. The midpoint of the range in pounds of butterfat production for any group is used as the numerical production rating for that group. The midpoint of the range for the above groups is approximately 475 for group 4, 625 for group 3, and 775 for group 2. Since the upper limit of production for group 1 is not known, an arbitrary midpoint rating of 925 is set. This makes all of the group ratings equally spaced. The 925 rating for group 1 represents a midpoint between 850 and 999 pounds.

For illustration, let it be assumed that the cows indicated in figure 1 were judged according to the Danish or group system, and the first two cows (E and G) were placed in the highest-type group; H, B, and C in the second group; J, I, A, and F in the third group; and D in the fourth group for type.

In this class of cows the production records were all made under official testing conditions, that is, the cows were milked three times daily for 365 days. Cows C and I have records of 402 and 488 pounds of butterfat, respectively, and since these records fall within the limits established for group 4, each cow is given the midpoint rating for that group—that is, a production rating of 475. The records of A, D, E, and F (640, 591, 644, and 601 pounds of butterfat, respectively) fall within the limits established for group 3 and each would be given the midpoint rating for that group, that is, a production rating of 625. Records of 701 and 810 pounds place G and H in group 2 for which the midpoint rating is 775; and B and J, with their production records of 988 and 872 pounds, are placed in group 1 and rated 925.

Each of the cows in the highest group for type receives a rating for type that is equivalent to the rating for the highest production group (in this case 925), and each of the cows in the lowest type group is given a rating equivalent to the rating for the lowest production group (in this case 475). The production ratings for the intermediate production groups are also given for the type ratings in the corresponding type groups (in this case 775 for group 2 and 625 for group 3).

PROCEDURE IN GROUP JUDGING

To illustrate the procedure to be followed in group judging, the method of assigning ratings and of arriving at the basis for making awards is shown in figure 2. This illustration shows a special placing card for this kind of judging, which has been filled in for the class of cows illustrated in figure 1 and discussed in the foregoing paragraphs.

At the top of each column of the placing card appears the letter, number, or other identification mark for one of the cows in the class. (See fig. 2.) The type group (group 1, 2, 3, or 4) in which each cow has been placed is entered on the first line, and her production record in pounds of butterfat is entered on the second line. Then the production rating allowed for that record (shown in the box near the bottom of the placing card) is entered on the third line. Each cow's rating for type is entered on the fourth line. Adding the figures on the third and fourth lines gives the cow's combined rating for production and type, which is entered on the fifth line. At the bottom of

the card a space is provided for listing the cows finally placed in each of the groups for which a prize, an award, or other recognition is provided.

PLACING CARD FOR COWS

[Judged by groups on basis of combined type and production ratings]

Breed----- Age class----- Date----- Judge-----

Procedure	Cows in the class to be judged									
	Cow A	Cow B	Cow C	Cow D	Cow E	Cow F	Cow G	Cow H	Cow I	Cow J
Type group-----	3	2	2	4	1	3	1	2	3	3
Production record (pounds of butterfat)-----	640	988	402	591	644	601	701	810	488	872
Production rating ¹	625	925	475	625	625	625	775	775	475	925
Type rating ² -----	625	775	775	475	925	625	925	775	625	625
Combined rating for production and type-----	1, 250	1, 700	1, 250	1, 100	1, 550	1, 250	1, 700	1, 550	1, 100	1, 550

¹ Basis for assigning production ratings.

² Basis for assigning type ratings.

Production group (pounds of butterfat)	Production rating
850 or more-----	925
700 to 849-----	775
550 to 699-----	625
400 to 549-----	475

Type group	Type rating
1-----	925
2-----	775
3-----	625
4-----	475

FINAL PLACINGS:

First award (cows with combined rating of -----1,850) - *None.*
 Second award (cows with combined rating of 1,550 to 1,700) - *B, E, G, H, J.*
 Third award (cows with combined rating of 1,250 to 1,400) - *A, C, F.*
 Fourth award (cows with combined rating of 950 to 1,100) - *D, I.*

FIGURE 2.—Placing card for judging cows by groups. It has been filled in to illustrate the results of judging a class of 10 cows.

BASIS FOR FINAL AWARDS

Where there are four groups for production and four groups for type, it is possible to obtain seven different totals or combined ratings for the class. With the production limits used in this illustration

(fig. 2) an animal in the lowest type group (with a type rating of 475) and also in the highest production group (with a production rating of 925) would have a combined rating of 1,400. The other possible combinations are 1,850; 1,700; 1,550; 1,250; 1,100; and 950.

In making the final placings or awards, perhaps only those animals that represent both the highest production group and the highest type group should be given the highest award. In that event, the highest award would be limited to cows having a combined rating of 1,850. Cows having a combined rating of 1,700 or 1,550 would perhaps be entitled to the award for second place, and those having a combined rating of 1,400 or 1,250 would be entitled to third place, while those with a combined rating of 1,100 or 950 would be given fourth place.

Following is a suggested production range for groups of cows whose records are made on twice-a-day milking and for a 305-day lactation period: For group 1, 600 pounds or more; for group 2, 500 to 599 pounds; for group 3, 400 to 499 pounds; and for group 4, 300 to 399 pounds of butterfat. In this case the production ratings for cows having records falling within the limits given for groups 1, 2, 3, and 4, respectively, would be 650, 550, 450, and 350. The type ratings likewise would be 650 for each of the cows placed in group 1 for type, 550 for each of the cows placed in group 2 for type, and so on. In this case also there would be seven possible values for combined ratings—1,300, 1,200, 1,100, 1,000, 900, 800, and 700. Any cows that have the combined rating of 1,300 would be those that were in the highest group for production and in the group representing the highest degree of perfection in type, and would be awarded the first prize or ribbon; those receiving combined ratings of 1,100 or 1,200 would be awarded the second prize or ribbon; those receiving combined ratings of 900 or 1,000 would be awarded the third prize or ribbon; and those receiving combined ratings of 700 or 800 would receive such recognition as might be given for the lowest award.

In the foregoing illustration of the plan of judging cows by groups, the production ratings were based on values represented by the mid-points of the production limits for the respective production groups. It would be possible to use the actual production records of the individual cows if desired. This would necessitate, however, the more laborious calculations involved in determining the prorated individual ratings; it would result in a variable departure from the 50-50 basis of combining type and production ratings; and it would result in a series of miscellaneous combined ratings for the individual cows for which an additional arbitrary grouping would have to be set up for each age class.

MODIFICATIONS OF THE PLAN

Since simplicity is one of the important benefits to be derived from the plan of judging cows by groups it may be appropriate to mention a modification of the plan which was used, apparently with general satisfaction, in connection with a show that was held exclusively for cows with dairy-herd-improvement-association records of production at Monmouth, Maine, in 1939. The records for all cows exhibited in this show were converted to maturity on the basis of 305 days and twice-a-day milking. The cows were classified by the judge into four type groups designated as "Excellent," "Very good," "Good," and "Fair."

A cow was awarded a purple, blue, red, white, or yellow ribbon for her combined type classification and production record, on the following basis:

Basis of Awarding Ribbons

Butterfat production record (pounds)	Type			
	Excellent	Very good	Good	Fair
500 or over----	Purple-----	Purple-----	Blue-----	Blue.
450-499-----	do-----	do-----	do-----	Red.
400-449-----	do-----	Blue-----	Red-----	White.
350-399-----	Blue-----	Red-----	White-----	Yellow.
300-349-----	Red-----	White-----	Yellow-----	No ribbon.

It will be noted that a purple ribbon, the highest of the five awards, could be won by cows of "Excellent" type if they had production records of 400 pounds or above, whereas "Very good" type cows could win a purple ribbon only if their production was 450 pounds or above, and the "Good" type and "Fair" type cows were not awarded purple ribbons under any circumstances. On the other hand a "Fair" type cow received no ribbon unless she had a record of 350 pounds or over, and no cow was given any award unless she had a record of 300 pounds or more. The lower the type classification, the higher the production had to be to qualify a cow for any given award.

PLAN FOR JUDGING SIREs

To make possible the competitive evaluation of sires on the basis of their performance, classes may be provided for bulls having five or more daughters, with Advanced Registry, Register of Merit, Roll of Honor, Herd Test, or dairy-herd-improvement-association records of production, out of dams having production records similarly classified and made under conditions sufficiently similar to afford dam-daughter comparisons of producing capacity.

The placing of the sires would be on the basis of (1) the type of their daughters; (2) the average butterfat production of their daughters; (3) the increase or decrease in butterfat production of all the daughters as compared with that of their dams; and (4) the consistency with which a sire's daughters show increases in production over their dams (proportion of total number of daughters that are better than their respective dams in butterfat production).³

This would be a "proved sire" class. It would have distinct value from an educational standpoint as it would illustrate a sound procedure to be followed in selecting a herd sire, and it would also be important as an advertising medium. The daughters of a sire could be entered for competition and be judged (placed) without the sire being present,

³ The points proposed for consideration, in addition to type of daughters, cover all the main points that were used as a basis for evaluating sires in connection with the study Superior Germ Plasm in Dairy Herds, U. S. Department of Agriculture Yearbook, 1936, pp. 997-1069, except the relation of the production of dams to the herd average. Determination of the herd average in connection with this plan for judging does not appear to be feasible.

PLACING CARD FOR SIRES

[When judged on the basis of the combined rating for type and production of their daughters]

Breed----- Age class----- Date-----

Judge-----

Order of procedure*	Sires judged, and the placings and ratings of each									
	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th
A. Average type of sire's daughters:										
1. Placing of sire, on type of daughters-----	D	G	J	A	I	H	C	F	B	E
8. Rating of sire, on type of daughters (uniform intervals)**-----	86.6	82.5	78.4	74.3	70.2	66.1	62.0	57.9	53.8	49.8
9. Rating of sire, on type of daughters (adjusted intervals)-----	86.6	82.5	82.0	73.1	72.7	65.1	61.3	57.2	50.0	49.8
B. Average production of sire's daughters:										
2. Rating of sire on production***-----	66.0	74.8	49.8	52.0	86.6	75.1	70.2	64.0	65.0	57.5
C. Average increase in butterfat production:										
3. Average production of dams (pounds)-----	566	645	451	511	830	745	552	580	630	502
4. Average amount of increase by daughters over their dams (pounds)-----	94	103	47	9	36	6	150	60	20	73
10. Rank of sire, on average increase by daughters over dams-----	3	2	6	9	7	10	1	5	8	4
11. Rating of sire, on average increase by daughters over dams***-----	72.3	74.6	60.3	50.6	57.5	49.8	86.6	63.6	53.4	66.9

D. Consistency of increase in production:											
5. Number of dam-and-daughter comparisons-----											
6. Number of daughters equal to or above their dams in production-----											
7. Percentage of daughters equal to or above their dams in production-----											
12. Rank of sire on consistency of increase-----											
13. Rating of sire on consistency of increase**-----											
E. Combined rating of sire:											
14. Sum of final ratings for items A, B, C, & D-----											
F. Final placing of sires:											
15. Order of placing, based on the combined rating-----											
30	60	21	14	18	22	18	10	19	16		
23	50	12	7	12	10	17	8	14	11		
76.7	83.3	57.1	50.0	66.7	45.5	94.4	80.0	73.7	68.8		
4	2	8	9	7	10	1	3	5	6		
73.2	78.2	58.4	53.1	65.6	49.8	86.6	75.7	70.9	67.2		
298.1	310.1	250.5	228.8	282.4	239.8	304.7	260.5	239.3	241.4		
1st	2d	3d	4th	5th	6th	7th	8th	9th	10th		
G	C	D	I	F	J	E	H	B	A		

*Number at the left of each item shows the order of procedure.

**The highest and lowest ranking sires (for type of daughters, for average amount of increase, and for consistency of increase) are given the same numerical rating that was given for the highest and lowest production. (See item 2.) The uniform interval for the intermediate type ratings is determined by dividing the difference between the maximum and the minimum ratings by a number which is one less than the number of sires represented; the intermediate ratings for increase are prorated according to the number of pounds of increase shown in item 4; those for consistency of increase are prorated on the basis of the magnitude of the percentages shown in item 7.

***10 percent of the average butterfat production of the sire's daughters.

FIGURE 3.—Placing card for use in judging sires on the basis of the combined rating for the average type and production of their daughters. The card has been filled in to illustrate the results of judging a class of 10 sires.

though the interest would probably be greater if he were shown along with his daughters. The objection to showing the sires is the danger involved in shipping valuable proved sires to fairs and shows for competition. This danger is so great that the showing of such sires is not recommended.

It is essential that the production records both of the sire's daughters and the dams of the daughters shall have been made under conditions as nearly comparable as possible; this applies especially to the number of milkings daily, comparable feeding, and so on. The records used in calculating the averages for daughters and for dams should be corrected to a mature-age basis.

The breed associations might be given the responsibility of preparing the production averages and other tabulations required in calculating the consistency of increase for each of the sires competing, except in classes consisting of dairy-herd-improvement-association animals, where the State extension dairyman or other college specialists would provide this information.

CARD FOR USE IN PLACING SIRES

Figure 3 shows a placing card designed to assist the judge in arriving at the final placing of a class of proved-sire groups. The card shown was prepared for a class of 10, but larger or smaller classes can be accommodated. The numbers at the extreme left indicate the order of procedure.

PROCEDURE FOR RATING SIRES

In order to illustrate the procedure of evaluating sires, the placing card (fig. 3) has been filled in with data for a hypothetical class of 10 sires.

The daughters of each sire constitute a separate group. The daughter groups are placed on type, and the designations of their respective sires are entered on the placing card in the proper order on the line marked "1."

An official of the fair or show next provides the necessary data pertaining to the class, and the calculations are entered on the placing card as indicated below:

Each sire's rating for production is entered on the line marked "2." The numerical production rating for a sire is the same as 10 percent of the average butterfat production of all his daughters (corrected to maturity). If, for example, a sire has daughters with an average butterfat production of 558 pounds, his rating would be 55.8. (Here also, as explained for cows, 1 point may be allowed for each pound of butterfat and the decimals omitted, if desired.)

The average butterfat production (mature or corrected to maturity) of the dams of the daughters is entered on the line marked "3."

The average increase or decrease in pounds of butterfat produced by the daughters as compared with the average production of their dams is entered on the line marked "4." In the case of a decrease, a minus sign would prefix the value.

The total number of dam-daughter comparisons on record for each sire is entered on the line marked "5."

The total number of individual daughters of each sire that equaled or excelled their dams in pounds of butterfat produced is entered on the line marked "6."

The percentage of the total number of daughters of each sire that equaled or excelled their dams in butterfat production is entered on the line marked "7." This percentage is calculated by dividing the number of daughters equal to or better than their dams, by the total number of dam-daughter comparisons listed for the sire under consideration.

RATING SIRE ON TYPE

The numerical ratings on type are then determined for each sire and entered on the line marked "8." The sire ranking first on the basis of type of daughters is assigned the same numerical rating as was given for the highest average-producing group of daughters in the class (line 2), and the sire ranking lowest for type of daughters is given the same rating as was given for the lowest average-producing group of daughters. The range in rating, therefore, is the same for type as for production. The intermediate ratings are determined according to the procedure described in connection with the individual cow classes. (See p. 7.) In all probability the judge will desire to adjust the type ratings to make them conform to conditions peculiar to the particular class judged. The line marked "9" is provided for the adjusted ratings.

The work of the judge can be greatly expedited if an official or clerk of the show calculates the ratings for type (uniform intervals) and the ratings for amount and for consistency of increase of daughters over dams in butterfat production. This can all be done before the judging of the class is commenced if the number of sires competing is known in advance, or it can be done while the judge is making his placings. As a matter of fact a clerk can, if desired, make all calculations and entries in the placing card except the order of placing on the basis of type (line 1) and the adjusted ratings on type (line 9), for which the necessary information must be furnished by the judge.

RATING SIRE ON PRODUCTION INCREASE

Line 10 on the placing card (fig. 3) provides a place for ranking the sires according to the extent to which their daughters excelled their dams in butterfat production. If it were possible to do so accurately, it would be desirable to make corrections for differences in the level of production of the dams to which the different sires were mated. However, because of unknown variations in environmental conditions, and in the germ plasm of the dams for the factors determining level of production,⁴ the comparison is restricted to the differences in level of production of daughters and their dams, as expressed in pounds of butterfat.

The numbers 1, 2, 3, and so on, are entered under the proper sire designations on the line marked "10" to indicate the order of rank of each sire with regard to amount of increase of daughters over dams. These ranks are then converted to ratings, by giving the highest rank (1) the same numerical rating as was given for the highest average production, and giving the lowest rank the same rating as was given for the lowest average production of the daughters (line 2).

⁴ For a more complete discussion of this subject, see pp. 1058-1064, U. S. Department of Agriculture Yearbook 1936, Limitations in Determination of How Poor A Sire May Be.

The intermediate ratings on increase are prorated between these limits according to the magnitude of the amounts of increase of daughters over dams. Table 1 is presented to illustrate the exact procedure followed in determining ratings for amount of increase of daughters over dams.

TABLE 1.—*Illustration of procedure in determining the intermediate sire ratings, for increase in average butterfat production by the daughters over their dams*

Designation and rank of sires for increase ¹		Average increase in butterfat production by daughters ²	Difference between each increase and the preceding one	Factor of equivalence ³	Amount to be subtracted from preceding sire's rating ⁴	Sire's rating for increase
<i>Sire</i>	<i>Rank</i>	<i>Pounds</i>	<i>Pounds</i>		<i>Points</i>	<i>Points</i>
C-----	1	150				⁵ 86.6
G-----	2	103	47	0.256	12.0	74.6
D-----	3	94	9	.256	2.3	72.3
E-----	4	73	21	.256	5.4	66.9
F-----	5	60	13	.256	3.3	63.6
J-----	6	47	13	.256	3.3	60.3
I-----	7	36	11	.256	2.8	57.5
B-----	8	20	16	.256	4.1	53.4
A-----	9	9	11	.256	2.8	50.6
H-----	10	6	3	.256	.8	⁵ 49.8

¹ From line 1 and line 10, fig. 3.

² From line 4, fig. 3.

³ The factor of equivalence is obtained by dividing the difference between the highest and lowest ratings for production (line 2, fig. 3) by the difference between the highest and lowest increase in average production (line 4, fig. 3). For example $\frac{86.6-49.8}{150-6}=0.256$, the factor of equivalence.

⁴ These amounts are obtained by multiplying the "difference between each increase and the preceding one" by the "factor of equivalence." For example, for sire G, $47 \times 0.256 = 12.0$, the amount to be subtracted from the preceding sire's rating (86.6-12.0) gives 74.6, the rating on increase for sire G.

⁵ The highest ranking sire for increase is assigned the same numerical rating for increase as was assigned to the highest ranking sire for production (line 2, fig. 3).

This is done by first dividing the difference between the highest and lowest ratings for production of daughters (line 2, fig. 3) by the difference between the highest and lowest amounts of increase of daughters over dams (line 4, fig. 3) to determine the equivalent difference in rating for each pound of difference in amount of increase in production. (See table 1.) The difference between the highest and second highest amount (table 1) is multiplied by the factor of equivalence so obtained, and the result is subtracted from the highest rating to give the rating for the second highest increase. The difference between the second and third highest amounts of increase in production is then multiplied by the same factor of equivalence, and the result is subtracted from the second highest rating to obtain the third rating, and so on until ratings have been assigned to each amount of increase of daughters over dams in pounds of butterfat production. The ratings

obtained in this manner are entered in the proper spaces on the line marked "11," in fig. 3.

It is possible, of course, that the daughters of a sire might have a lower average butterfat production than that of their respective dams. Suppose, for illustration, that the last sire had lowered production 6 pounds instead of raising it by that amount. In that event the -6 pounds would have the lowest rank and be rated 49.8, as shown in table 1, and the range in ratings would be unchanged. However, the range in increases would become 156 instead of 144, the factor of equivalence would become 0.236 ($36.8 \div 156$) instead of 0.256, and the difference on the last line (table 1) would become 15 instead of 3. Multiplying each difference by 0.236 would reduce all of the amounts to be subtracted except the last and consequently would raise all of the ratings except the first and last.

RATING THE SIRES ON CONSISTENCY OF INCREASE

The ranking of the sires on consistency of increase is determined on the basis of the percentage of the total number of daughters of each sire that equaled or excelled their respective dams in butterfat production. The source and method of calculating these percentages has been discussed. (See p. 17.) The ranks 1, 2, 3, etc., indicating the order of magnitude of the percentages, are entered under the proper sire designation on the line marked "12" on the placing card (fig. 3).

Rating the sires on the basis of the consistency with which the individual daughters excelled their respective dams in butterfat production is also highly important. The importance can be emphasized by calling attention to the fact that, although two sires may raise the average production of their daughters over that of their dams by the same amount, in the case of one sire the average increase may result from a small number of large increases which more than offset a large number of small decreases; whereas in the case of the other sire, all the daughters may be moderately but consistently better than their dams. Usually the sire with the greatest percentage of daughters showing increases is deserving of the highest rating. The sire having the highest rank (line 12, fig. 3) is given the same rating as was given for the highest average production of daughters and the one having the lowest rank is given the same rating as was given for the lowest average production of daughters (line 2, fig. 3). The intermediate ratings are prorated between these established limits on the basis of the magnitude of the percentages given on line 7, according to the procedure described in connection with ratings for the amount of increase by daughters over dams. Ratings for consistency of increase are entered in the proper spaces on line 13, fig. 3. The exact procedure is shown in table 2. Obviously, minus values cannot occur in connection with these percentages.

TABLE 2.—*Illustration of procedure in determining ratings for percentage (consistency) of daughters having higher butterfat production records than their dams*

Designation, and rank of sires for consistency of increase ¹		Daughters equal to or higher than dams in butterfat production ²	Difference between each percentage and next higher one	Factor of equivalence ³	Amount to be subtracted from preceding sire's rating ⁴	Sire's rating for consistency of increase
<i>Sire</i>	<i>Rank</i>	<i>Percent</i>	<i>Percent</i>		<i>Points</i>	<i>Points</i>
C-----	1	94.4				⁵ 86.6
G-----	2	83.3	11.1	0.753	8.4	78.2
F-----	3	80.0	3.3	.753	2.5	75.7
D-----	4	76.7	3.3	.753	2.5	73.2
B-----	5	73.7	3.0	.753	2.3	70.9
E-----	6	68.8	4.9	.753	3.7	67.2
I-----	7	66.7	2.1	.753	1.6	65.6
J-----	8	57.1	9.6	.753	7.2	58.4
A-----	9	50.0	7.1	.753	5.3	53.1
H-----	10	45.5	4.5	.753	3.4	⁵ 49.8

¹ From line 1 and line 12, fig. 3.

² From line 7, fig. 3.

³ Range in ratings (line 2, fig. 3) divided by range in percentages (line 7, fig. 3)
 $86.6 - 49.8 = 0.753$, the factor of equivalence.

⁴ These amounts are determined by multiplying the "difference between each percentage and the next higher one" by the "factor of equivalence." For example, for Sire G, $11.1 \times 0.753 = 8.4$, the amount to be subtracted from the preceding sire's rating ($86.6 - 8.4$) gives 78.2, the rating for Sire G on consistency.

⁵ Highest and lowest ratings are determined by highest and lowest average butterfat production of daughters (line 2, fig. 3).

If two or more sires have daughters that show identical average increases above the records of their dams in pounds of butterfat, each of them is given the same rank. For example, if the highest increase is 150 pounds it will, of course, be given a rank of 1. If the next two increases are both 125 pounds, each of the two so tied is given a rank of 2 and the next highest increase is given a rank of 4. Also, if two sires are tied for first rank, each of those so tied is given a rank of 1 and the next highest is ranked 3. The same procedure is followed in ranking the sires for the percentage of daughters equal to or above their dams in butterfat production. Duplicate ranks resulting from ties either in amount or in consistency of increase of daughters over dams are, of course, given identical ratings.

COMBINED RATING AND FINAL PLACING

After the groups of daughters have been placed on the basis of type, and the ratings for type and for amount and consistency of increase in butterfat production have been calculated, the combined rating for each sire is determined by adding the final ratings for the four factors under consideration (items A, B, C, and D, fig. 3), which appear under each sire designation in the heavily outlined squares on the placing card. The sums are entered on the line marked "14."

Finally the letter (or other sire designation) appearing at the top of the column having the highest total, is entered in the first space on

line "15." The letter having the second highest total is entered in the second square and so on until the final order of placing is shown for all the sires.

POINTS TO CONSIDER IN USING THIS PLAN

It will be noted that, whereas in placing cows only type and record of production are taken into consideration and each is given equal weight, in placing herd sires two additional factors—amount and consistency of increase of daughters over dams—are considered. Each of the four factors for sires is given equal weight. In evaluating the breeding performance of sires, therefore, type of daughters represents 25 percent and their producing performance in relation to that of their dams represents 75 percent of the total. This ratio can be changed, if desired, by applying suitable factors to the adjusted ratings before they are added.

The showing of proved-sire groups would involve the weakness from a hereditary standpoint, that is common to all show-ring procedure, in that the animals entered for competition would probably constitute a highly selected group that would represent only the best of a given sire's daughters. It probably would not be feasible to enter for competition all the daughters of a sire, except in local fairs or in the case of sires having only a few tested daughters, as the expense of showing a large number of daughters might be prohibitive. The competition in such a class loses significance, of course, in proportion to the amount of selection practiced in assembling each sire group. As a means of minimizing the effect of selection it may be found desirable to require exhibiting either a minimum number, or a minimum percentage of a sire's living daughters having records of production comparable with those of their dams, in order to establish the eligibility of that sire for competition.

If only a limited number of a sire's available daughters are entered in competition for the type placing, the question arises as to whether the various ratings involving production should be calculated on the basis of only the daughters entered, or on the basis of all the daughters of the sire for which comparable dam-daughter ratings are available. In the first case the rating of the sire may be made on a limited number of daughters that may represent a high degree of selection for both type and production. In the second case, the daughters that are exhibited may represent selection for type, but since the production rating is made on all of the tested dam-daughter pairs on record, the production rating will be on unselected daughters, providing there was no selection in the daughters that were tested. As an argument in favor of the latter course it may be said that in many cases some of the tested daughters of a sire may be unavailable for showing because of death or sale, or rendered unfit for exhibiting because of injury or disease, and that if such a sire were being considered for breeding purposes the production records of the daughters that were not available for a type analysis, would not be ignored because of that fact.

In the foregoing illustration of a method of rating sires, the average production records, the average amount of increase of daughters over dams in butterfat production, and the percentage of daughters equal

to or superior to their dams in butterfat production, are based on all of the dam-daughter comparisons on record, and not limited to the daughters exhibited.

APPLYING THE TYPE-AND-PRODUCTION PLAN TO JUDGING CONTESTS

CONDUCT OF THE CONTEST

The essentials of the plan outlined for judging cows and herd sires in the show ring, on the basis of type and performance combined, can be used effectively in a dairy cattle judging contest.

Cow classes would include only cows with production records. At least one class of mature cows in each breed should be available for the contest. If time and number of animals permitted it would be desirable to have the contestants judge more than one class in each breed. If classes are provided for immature cows the age classification should be the same as for the regular show-ring classes. Herd-sire classes would be limited to sires having five or more daughter-dam pairs for comparison, both daughter and dam in each comparison having comparable production records made under some recognized system of supervision.

Judges having suitable training and qualifications would make the official placings which provide the basis for grading contestants.

In arriving at the final placing for the classes of cows used in the contest, judges and contestants would follow the essentials of the procedure outlined for general show-ring practice. Instead of placing rings of four selected cows on the basis of type only, as at present, they would be called on to aline larger numbers of animals in a class, in order from the best to the poorest, on the basis of production and type combined. The plan described for judging sires by their progeny might also be followed in all essentials in the judging contest.

REASONS

The contestant would not be required to give reasons for his placings, for either cow or herd-sire classes. In alining a class of animals according to this plan, he would have sufficiently demonstrated the soundness of his judgment so there would be no need to give reasons. Eliminating the practice of giving reasons would permit the contestants to complete their work in a much shorter time, which would enable both the contestants and their coaches to hear the discussion of the classes by the judges. It would also avoid the difficult problem of evaluating the reasons satisfactorily, and it would greatly simplify the problem of conducting the contest.

OBSERVING THE WORK OF THE JUDGE

After the students have turned in their placing cards it will be desirable for them to see the work of the official judge. The judge should be allowed as much time as may be necessary for shifting the animals about in arriving at the correct placing on type, and finally to realine them on the basis of type and production. Obviously the students cannot be permitted to move the animals about when they are making their placings because of the confusion that would result.

GRADING THE CONTESTANTS⁵

An effort has been made to develop a plan that will be fair to the contestants, be simple to apply, be applicable to classes of different size, give approximately a zero grade for a complete reversal of the class, and eliminate as far as possible the ties in contestant grades that have been largely overcome in past judging contests by grades on reasons.

After a number of different plans were considered, it became apparent that some sort of a graduated scale was needed—one that would provide greater penalties for moving the top animals a few places from their correct position than for moving the animals at the bottom of the class the same number of places.

According to the plan developed, and outlined here, the contestant would be graded on the basis of his final arrangement of the entire class. He would receive a penalty for placing any animal out of its correct position (the position determined by the official judge) and the severity of the penalty would depend on the number of places the animal was moved out of its correct position. The same penalty would be imposed for placing the first animal in the last place as for placing the last animal in first place. The plan practically eliminates ties in contestant grades, except in cases where two or more contestants turn in cards with identical placings and in a few cases where the interchange of animals is confined to the lower half of large classes.

Table 3 shows the penalties for evaluating the contestant's placings, when classes of from 4 to 12 cows are judged.

TABLE 3.—*Penalty scales for evaluating a contestant's placings, when classes of from 4 to 12 cows are judged*

4-COW CLASS

Place	2	3	4
1	12.5	24.9	37.2
2	---	12.4	24.7
3	---	---	12.3

5-COW CLASS

Place	2	3	4	5
1	8.4	16.7	24.9	33.0
2	---	8.3	16.5	24.6
3	---	---	8.2	16.3
4	---	---	---	8.1

6-COW CLASS

Place	2	3	4	5	6
1	5.7	11.3	16.8	22.2	27.5
2	----	5.6	11.1	16.5	21.8
3	----	----	5.5	10.9	16.2
4	----	----	----	5.4	10.7
5	----	----	----	----	5.3

⁵ Acknowledgment is made to J. B. Parker, senior dairy husbandman, Bureau of Dairy Industry, for the tables and plan proposed for grading contestants.

TABLE 3.—*Penalty scales for evaluating a contestant's placings, when classes of from 4 to 12 cows are judged—Continued*

7-COW CLASS

Place	2	3	4	5	6	7
1	4.4	8.7	12.9	17.0	21.0	24.9
2	----	4.3	8.5	12.6	16.6	20.5
3	----	----	4.2	8.3	12.3	16.2
4	----	----	----	4.1	8.1	12.0
5	----	----	----	----	4.0	7.9
6	----	----	----	----	----	3.9

8-COW CLASS

Place	2	3	4	5	6	7	8
1	3.4	6.7	9.9	13.0	16.0	18.9	21.7
2	---	3.3	6.5	9.6	12.6	15.5	18.3
3	---	---	3.2	6.3	9.3	12.2	15.0
4	---	---	---	3.1	6.1	9.0	11.8
5	---	---	---	---	3.0	5.9	8.7
6	---	---	---	---	---	2.9	5.7
7	---	---	---	---	---	---	2.8

9-COW CLASS

Place	2	3	4	5	6	7	8	9
1	2.8	5.5	8.1	10.6	13.0	15.3	17.5	19.6
2	---	2.7	5.3	7.8	10.2	12.5	14.7	16.8
3	---	---	2.6	5.1	7.5	9.8	12.0	14.1
4	---	---	---	2.5	4.9	7.2	9.4	11.5
5	---	---	---	---	2.4	4.7	6.9	9.0
6	---	---	---	---	---	2.3	4.5	6.6
7	---	---	---	---	---	---	2.2	4.3
8	---	---	---	---	---	---	---	2.1

10-COW CLASS

Place	2	3	4	5	6	7	8	9	10
1	2.4	4.7	6.9	9.0	11.0	12.9	14.7	16.4	18.0
2	--	2.3	4.5	6.6	8.6	10.5	12.3	14.0	15.6
3	--	--	2.2	4.3	6.3	8.2	10.0	11.7	13.3
4	--	--	--	2.1	4.1	6.0	7.8	9.5	11.1
5	--	--	--	--	2.0	3.9	5.7	7.4	9.0
6	--	--	--	--	---	1.9	3.7	5.4	7.0
7	--	--	--	--	---	---	1.8	3.5	5.1
8	--	--	--	--	---	---	---	1.7	3.3
9	--	--	--	--	---	---	---	---	1.6

TABLE 3.—*Penalty scales for evaluating a contestant's placings, when classes of from 4 to 12 cows are judged—Continued*

11-COW CLASS

Place	2	3	4	5	6	7	8	9	10	11
1	2.1	4.1	6.0	7.8	9.5	11.1	12.6	14.0	15.3	16.5
2	---	2.0	3.9	5.7	7.4	9.0	10.5	11.9	13.2	14.4
3	---	---	1.9	3.7	5.4	7.0	8.5	9.9	11.2	12.4
4	---	---	---	1.8	3.5	5.1	6.6	8.0	9.3	10.5
5	---	---	---	---	1.7	3.3	4.8	6.2	7.5	8.7
6	---	---	---	---	---	1.6	3.1	4.5	5.8	7.0
7	---	---	---	---	---	---	1.5	2.9	4.2	5.4
8	---	---	---	---	---	---	---	1.4	2.7	3.9
9	---	---	---	---	---	---	---	---	1.3	2.5
10	---	---	---	---	---	---	---	---	---	1.2

12-COW CLASS

Place	2	3	4	5	6	7	8	9	10	11	12
1	1.9	3.7	5.4	7.0	8.5	9.9	11.2	12.4	13.4	14.3	15.1
2	---	1.8	3.5	5.1	6.6	8.0	9.3	10.5	11.5	12.4	13.2
3	---	---	1.7	3.3	4.8	6.2	7.5	8.7	9.7	10.6	11.4
4	---	---	---	1.6	3.1	4.5	5.8	7.0	8.0	8.9	9.7
5	---	---	---	---	1.5	2.9	4.2	5.4	6.4	7.3	8.1
6	---	---	---	---	---	1.4	2.7	3.9	4.9	5.8	6.6
7	---	---	---	---	---	---	1.3	2.5	3.5	4.4	5.2
8	---	---	---	---	---	---	---	1.2	2.2	3.1	3.9
9	---	---	---	---	---	---	---	---	1.0	1.9	2.7
10	---	---	---	---	---	---	---	---	---	0.9	1.7
11	---	---	---	---	---	---	---	---	---	---	0.8

Each penalty scale is prepared in such a way that a contestant who completely reverses the correct order of an entire class will receive penalties totaling approximately 100 points, or a grade of approximately zero. The penalty to be applied for each animal misplaced is shown at the intersection of a vertical and a horizontal column, one of which is headed by the numeral indicating the correct placing and the other by the numeral indicating the contestant's placing. For example, if the correct placing for the animal is second place and the contestant places the animal in fourth place, or vice versa, the penalty is shown where columns 2 and 4 intersect.

In order to illustrate the manner in which a contestant is graded on his placing of a class, let it be assumed that the class contains 12 cows and that the correct placing is A—B—C—D—E—F—G—H—I—J—K—L. A number of different possible placings are given in table 4. Reference to the penalties for a 12-cow class in table 3 and to the following discussion will explain the application of the method of grading contestant placings.

TABLE 4.—*Eight different placings made by 8 contestants in judging a class of 12 cows, and the net grade each contestant would receive for his placing*

Contestant number and description of his placing	Designation of animal placed—												Total penalties	Net grade
	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth		
1. Correct placing....	A	B	C	D	E	F	G	H	I	J	K	L	Points 0. 0	Points 100. 0
2. First cow placed eleventh, others in correct order.....	B	C	D	E	F	G	H	I	J	K	A	L	28. 6	71. 4
3. Badly mixed placing.....	C	E	H	I	L	K	J	A	F	G	D	B	81. 4	18. 6
4. Cows in each of three top pairs interchanged....	B	A	D	C	F	E	G	H	I	J	K	L	10. 2	89. 8
5. Cows in each of three bottom pairs interchanged.....	A	B	C	D	E	F	H	G	J	I	L	K	6. 2	93. 8
6. First and second cows interchanged.....	B	A	C	D	E	F	G	H	I	J	K	L	3. 8	96. 2
7. Second and third cows interchanged.....	A	C	B	D	E	F	G	H	I	J	K	L	3. 6	96. 4
8. Complete reversal of class.....	L	K	J	I	H	G	F	E	D	C	B	A	99. 6	. 4

The first placing given in table 4, for contestant No. 1, is the correct one. The contestant turning in a correct placing would not be subject to any penalty and would receive a grade of 100.

The second contestant's placing is one in which the cow that should be first is placed eleventh, but all the others are in the correct order. According to table 3 the penalty for putting the first cow in the eleventh place in a 12-cow class is 14.3. The penalty for moving B from second to first place is 1.9. Other penalties are: For moving C from third to second place, 1.8; D from fourth to third, 1.7; E from fifth to fourth, 1.6; F from sixth to fifth, 1.5; G from seventh to sixth, 1.4; H from eighth to seventh, 1.3; I from ninth to eighth, 1.2; J from tenth to ninth, 1.0; and K from eleventh to tenth, 0.9. L is in the correct place and no penalty is given. The sum of penalties in this case is 28.6 points, leaving a net grade of 71.4.

The third contestant's placing is badly mixed. Penalties in this case are: For moving A from first to eighth place, 11.2; B from second to twelfth, 13.2; C from third to first, 3.7; D from fourth to eleventh, 8.9; E from fifth to second, 5.1; F from sixth to ninth, 3.9; G from seventh to tenth, 3.5; H from eighth to third, 7.5; I from ninth to fourth, 7.0; J from tenth to seventh, 3.5; K from eleventh to sixth, 5.8; and L from twelfth to fifth, 8.1. Penalties in this case total 81.4 and the grade is 18.6.

In the fourth placing the animals in each of the three top pairs are interchanged, but all the others are in the correct position. Penalties

in this case are: For moving A from first to second, 1.9; B from second to first, 1.9; C from third to fourth, 1.7; D from fourth to third, 1.7; E from fifth to sixth, 1.5; and F from sixth to fifth, 1.5. In this case penalties total 10.2 points and the contestant's grade is 89.8.

In the placing by the fifth contestant, the animals in the last three pairs instead of top three pairs are interchanged, and the first six are correctly placed. Penalties in this case are: For moving G from seventh to eighth place, 1.3; H from eighth to seventh, 1.3; I from ninth to tenth, 1.0; J from tenth to ninth, 1.0; K from eleventh to twelfth, 0.8; and L from twelfth to eleventh, 0.8. Penalties for this placing total only 6.2 points and the score given the contestant is 93.8. In grading systems commonly used the fourth and fifth contestants would have received the same penalties. According to this method, however, the contestant making the interchanges in the top three pairs would receive a score of 89.8, but the one making the same errors in the bottom three pairs would receive a score of 93.8.

In the placing by the sixth contestant, all the animals are in correct position except the first two, which are interchanged. The penalties in this case are 1.9 for moving A from first to second place and 1.9 for moving B from second to first place, a total penalty of 3.8, or a net score of 96.2.

The placing by the seventh contestant is like the one by the sixth, except that the second and third animals are interchanged instead of the first and second. The penalties for the seventh contestant are 1.8 points for moving B from second to third place and 1.8 points for moving C from third to second place, making a total penalty of 3.6 and allowing a net score of 96.4. On the average the seriousness of interchanging the first and second animals is not greatly different from interchanging the second and third, but on the basis of grading systems ordinarily used the two errors would result in identical scores involving ties for the contestants making the placings. The grading system outlined here allows a net score of 96.2 in the first case and 96.4 in the second—a difference not so great as to indicate a marked difference in judging ability, yet great enough to avoid a tie in the net score.

The eighth contestant's placing is a complete reversal of the class. Penalties in this case are: For moving A from first to twelfth place, 15.1; B from second to eleventh, 12.4; C from third to tenth, 9.7; D from fourth to ninth, 7.0; E from fifth to eighth, 4.2; F from sixth to seventh, 1.4; G from seventh to sixth, 1.4; H from eighth to fifth, 4.2; I from ninth to fourth, 7.0; J from tenth to third, 9.7; K from eleventh to second, 12.4; and L from twelfth to first, 15.1. In this case the penalties total 99.6 and a net score of 0.4 would be given the contestant.

The same system of assigning penalties would be followed with a smaller class of animals and can be adapted for a larger one. Obviously the penalties for interchanging a pair of animals or for placing an animal a given number of places out of position will increase as the size of the class diminishes and decrease as the size of the class becomes greater. Furthermore, the penalty for interchanging the top pair differs from the penalty for interchanging the bottom pair to a greater extent in a class of 12 cows than in a class of 5 cows. For example, the penalty for switching the top pair in a class of 5 cows is 16.8 points and for switching the bottom pair in the same class it is 16.2 points, a difference of only 0.6. In the 12-cow class the switch at the top

is penalized 3.8 points and at the bottom 1.6 points, a difference of 2.2, which is nearly four times as great as in the class less than half its size. This appears logical, as the relative position of the last pair of cows in a 12-cow class is usually considered less important than the relative position of the last 2 cows in a small class.

Grading the contestants on their efficiency in judging herd sires would be the same in every respect as in judging cows and the same tables would be used.

As soon as grades are assigned to each contestant's placing for every class of animals judged, the grades may be arranged and combined in any manner desired and necessary to determine the standing of the individual contestant or of the team of which he is a member.

THE USE OF PHOTOGRAPHS TO DEMONSTRATE THE PLAN

Often it may be desirable to demonstrate this plan of judging dairy cattle at meetings of various kinds, such as small groups of educators, breeders, farmers, and others, where classes of animals cannot be used. Photographs of individual animals, that are made on the same scale and mounted on heavy backs so they may be stood up in easels or leaned against the wall, are very satisfactory for such demonstration.

Extension workers, county agents, and other educators who may have occasion to discuss or demonstrate the plan of judging cows can provide themselves with a set of 10 or more individual-cow photographs for any or all breeds and be in a position to conduct a demonstration at any time on a moment's notice. The picture judging, when used with small groups of people, invariably arouses interest and a spirit of competition and is nearly as effective as a class of cows for demonstrating the plan. Sets of 10 pictures are neither heavy nor bulky and can easily be carried in a brief case. Once the method of judging cows on this basis is understood, the method of evaluating herd sires should follow easily.